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DESCRIPTIONS OF NEW INVENTIONS PUBLISHED

OW281429 Beijing XINHUA in English 1249 GMT 28 Dec 81

[Text] Beijing, December 28 (XINHUA)--China has published descriptions of 280 inventions over the past three years, said an official of the recommendation and examination committee in charge of classifying inventions under the State Scientific and Technological Commission.

The committee published 132 this year, 107 in 1980 and 41 in 1979. Nearly 1,000 applications for registration of inventions have been received since regulations for making awards to people working in the natural sciences were published by the State Council three years ago.

These inventions are in the fields of agriculture, culture, light and textile industries, education and public health, energy, communications and transportation, environmental protection and national defence.

In agriculture the breeding of a new strain of hybrid non-glutinous rice was one of the published inventions. The technology has been exported to the United States. It also resulted in a 13 million ton increase in rice yield in China in 1980.

A cheap protective slag for large slab casters is one of the inventions now in use at the Wuhan Iron and Steel Company in Hubei Province. Because of this invention, 15,000 tons of slabs are produced each year, valued at nearly ten million yuan.

A new high-quality steel for making super heaters and reheaters is now being used in high-pressure boilers of up to 200,000 kilowatts.

A powdered coal injection technique for blast furnaces has been sold to Great Britain.

The committee official said that these inventions are the result of hard and dedicated work by scientists, technicians and workers in China's 300 research institutes. It also indicates that the party policy on science and technology is supportive.

He called for encouragement of those people working in research and for formulating detailed regulations on rewarding inventors.

CSO: 4020/66

APPLIED SCIENCES

SCIENTISTS' ROLE BROUGHT INTO FULLER PLAY

OW291137 Beijing XINHUA in English 0738 GMT 29 Dec 81

[Text] Beijing, December 29 (XINHUA)--The Chinese Academy of Sciences has brought into full play the role of the scientists who are giving greater academic leadership since the general assembly of the division members of the Chinese Academy of Sciences last May.

A growing number of professionals have assumed leadership at academy and institute levels. Lu Jiaxi, professor of chemical physics, has taken up the office of presidency of the academy. Scientists of nuclear energy, materials, metallurgy, bioneurology and atmospheric physics are elected vice-presidents. The academy's institutes are almost all headed by scientists who have achieved outstanding results. Among them are Peng Huanwu, Wu Xuezhou, Wang Yinglai, Yin Zanxun and Wang Daheng, working respectively in theoretical physics, chemistry, biology, geology and technical sciences.

Scientists are giving their guidance by going to various institutes to appraise research programs.

A group of 28 technical scientists led by Li Xun, a specialist in metals and vice-president of the academy, went to the institute of metals in Shenyang in August this year. They studied the feasibility of the institute's research projects and commented on its research results in high-temperature metallurgy, the metallurgy of alloys, vacuum metallurgy and studies in metal crystallic structures. After a series of panel discussions, the visiting scientists suggested that the institute affirmed the outstanding contributions the institute made in basic research in metal physics, and suggested that it step up its work in this field.

Work of the institutes of botany, applied chemistry, optics and precision machinery, physics and geology also have been appraised in the same way.

At a Standing Committee meeting of the division of biology in September, a 5-year plan was made to conduct research in molecular biology, cytobiology, neurobiology, molecular genetics and biological nitrogen fixation.

The division of earth sciences held a meeting of scientists in Qingdao in June and decided to make marine geology the center of its research. The scientists also decided to strengthen basic studies in the development of oil formations and sedimentary basins of oil and natural gas reserves. The focus of their work will be China's continental shelf.

CSO: 4020/66

AMOUNT OF RESIDUAL PU-239 IN NUCLEAR DEBRIS DETERMINED

Beijing HE HUAXUE YU FANGSHE HUAXUE [JOURNAL OF NUCLEAR AND RADIOCHEMISTRY] in Chinese Vol 3, No 3, Aug 81 pp 173-179

[Article by the Radiochemistry Research Laboratory of the Northwestern Nuclear Technology Institute: "Determination of the Amount of Residual Plutonium-239 in Nuclear Explosion Debris"*]

[Text] Abstract

The amount of residual plutonium-239 ($^{239}Pu_R$) in the cloud of debris of a nuclear explosion has been measured using mass spectrometric analysis and α spectrometric analysis. Interference by ^{239}Pu produced due to the (n, γ) reaction of ^{238}U and through cascade β decay can be corrected by direct subtraction or by the method of linear fitting. A procedure of radiochemical analysis that satisfies the requirements of the test was established, and the method of storing the solution of the plutonium diluent of a low concentration ($\sim 10^{-9}$ M) was explored. The error of direct subtraction is not larger than ±5%, but it is only suitable when the amount of ^{239}U produced is small, and the quantitative separation of uranium, neptunium and plutonium must occur as early as possible. The error of linear fitting is generally smaller than ±4%, and it seems that this method is superior when more ^{239}U is produced.

I. Principle

A cloud of nuclear debris includes two sources of ^{239}Pu: One is residual $^{239}Pu_R$ from burning of the material. The other part is produced by the reaction ^{238}U (n, γ) ^{239}U and through two β decays. Therefore, to measure the amount of $^{239}Pu_R$, the contribution of the latter part must be subtracted from the total amount. Its expression is written below:

---

*This article was received on 16 May 1980.

$$
{}^{239}\mathrm{Pu}_R = {}^{239}\mathrm{Pu}_t - {}^{239}\mathrm{U}_0\left(1 - \frac{\lambda_1^9}{\lambda_1^9 - \lambda_2^9} e^{-\lambda_2^9 t}\right)
$$

$$
= {}^{239}\mathrm{Pu}_t - {}^{239}\mathrm{U}_0(1 - 1.007\ e^{-\lambda_2^9 t}). \tag{1}
$$

In the equation, ${}^{239}\mathrm{Pu}_t$ represents the total amount of plutonium-239 in the cloud of debris at time t after the explosion; λ_1^9, λ_2^9 respectively represent the decay constants of uranium-239 and neptunium-239; ${}^{239}\mathrm{U}_o$ is the total amount of plutonium-239 in the cloud of debris at the moment of explosion.

We know from equation (1) that to measure ${}^{239}\mathrm{Pu}_R$, we need to measure ${}^{239}\mathrm{Pu}_t$ and ${}^{239}\mathrm{U}_o$ experimentally. The method of measuring ${}^{239}\mathrm{U}_o$ has already been introduced in special articles [1]. There are two methods of calculating ${}^{239}\mathrm{Pu}_R$:

1. Direct subtraction: When calculating the total amount of ${}^{239}\mathrm{Pu}$ in the debris of a nuclear cloud by analyzing a sample, we must know the proportion the sample occupies in the entire nuclear cloud of debris, i.e., we must take a sampling coefficient ε. Because the total amount (${}^{237}\mathrm{U}_o$) of ${}^{237}\mathrm{U}$ in the cloud can be accurately determined [1], we can simultaneously measure the amounts of plutonium-239 $({}^{239}\mathrm{Pu}_t)_s$ and the amount of uranium-237 $({}^{237}\mathrm{U})_s$ in the sample and obtain the sampling coefficient of the sample through uranium-237. At this time, equation (1) can be written as

$$
{}^{239}\mathrm{Pu}_R = \frac{1}{\varepsilon}\left[({}^{239}\mathrm{Pu}_t)_s - {}^{239}\mathrm{U}_s(1 - 1.007e^{-\lambda_2^9 t})\right]
$$

$$
= {}^{237}\mathrm{U}_0\left[\frac{({}^{239}\mathrm{Pu}_t)_s}{{}^{237}\mathrm{U}_s} - \frac{{}^{239}\mathrm{U}_s}{{}^{237}\mathrm{U}_s}(1 - 1.007e^{-\lambda_2^9 t})\right]. \tag{2}
$$

The value ${}^{239}\mathrm{U}_s/{}^{237}\mathrm{U}_s$ in the equation can be measured by taking another sample[1]. $({}^{239}\mathrm{Pu}_t)_s$ is measured by the mass spectrometric isotopic dilution method; ${}^{237}\mathrm{U}_s$ is measured by the γ spectrometer.

2. Direct fitting method: We take several samples and separately measure the changes in the ratio of the abundance of plutonium-239 in the sample of cloud debris at different times after the explosion and the abundance of a plutonium isotope ${}^{i}\mathrm{Pu}$ (such as plutonium-238, plutonium-241) whose content does not change with time. At this time, equation (1) can be written as

$$
\frac{{}^{239}\mathrm{Pu}_t}{{}^{i}\mathrm{Pu}} = \frac{{}^{239}\mathrm{Pu}_R}{{}^{i}\mathrm{Pu}} + \frac{{}^{239}\mathrm{U}_0}{{}^{i}\mathrm{Pu}}(1 - 1.007e^{-\lambda_2^9 t}). \tag{3}
$$

Let

$$
\frac{{}^{239}\mathrm{Pu}_t}{{}^{i}\mathrm{Pu}} = Y;\quad \frac{{}^{239}\mathrm{Pu}_R}{{}^{i}\mathrm{Pu}} = b;\quad \frac{{}^{239}\mathrm{U}_0}{{}^{i}\mathrm{Pu}} = a;\quad 1 - 1.007e^{-\lambda_2^9 t} = x.
$$

then we can obtain a straight line equation

$$Y = b + ax. \tag{4}$$

After a series of ${}^{239}Pu_t/{}^{i}Pu$ values have been measured by α spectrometric and mass spectrometric analysis, we treat the measured Y and x values by the least square method. Thus we can calculate the section distance b and the slope a. From equations (3) and (4) we have

$${}^{239}Pu_R = \frac{b}{a}\,{}^{239}U \tag{5}$$

Because the measuring error of the ratio of abundance ${}^{239}Pu_t/{}^{i}Pu$ is smaller than the error of the quantitative measurement of ${}^{239}Pu_t$, we have increased the accuracy of the value of ${}^{239}Pu_R$.

Summarizing the above, we see that the accuracy of measuring ${}^{239}Pu_R$ is mainly determined by the following factors: 1) the accuracy of each of the measured amounts in equations (2) and (3); 2) the degree of asynchronism of chemical loss of plutonium, uranium and neptunium during the course of treating the entire sample up to the time of separating plutonium; 3) the accuracy of the time of separation of plutonium, uranium and neptunium; 4) the degree of cleansing of uranium and neptunium by the plutonium separation process; and 5) the degree of separation and condensation of plutonium and uranium.

II. Experimental Part

1. Reagent and Instruments

${}^{242}Pu$ diluent: ${}^{239}Pu/{}^{242}Pu$ (atomic ratio) = 8.656%; ${}^{238}Pu$ diluent: ${}^{239}Pu/{}^{238}Pu$ (atomic ratio) ≈ 9%; both provided by the Atomic Energy Institute of the Chinese Academy of Sciences.

Anion exchange resin: Dowex 1 x 2 resin (100 to 200 pores, NO_3^- type). 201 x 5 resin (100 to 160 pores, NO_3^- type), provided by the Beijing Uranium Ore Selection and Metallurgical Institute.

Electrical sedimentation device: Same as in reference [2].

Mass spectrometer: West German CH4/II type surface heated ionization mass spectrometer (the evaporation belt is a domestically produced tantalum belt, the ionization belt is a domestically produced rhenium belt). The precision of measurement of the abundance ratio of the plutonium isotopes is about ±0.5%, the accuracy is based on the measured accuracy of the abundance of uranium, taken to be ±1.0%.

The α grid ionization chamber: Resolution is about 1%, absolute error of measurement is about 1%, product of the Atomic Energy Institute of the Chinese Academy of Sciences.

Semiconductor α spectrometer: Consists of the French SAIP spectrometer and a gold-silicon surface pile α-semiconductor detector fitted with a Didac-800 model 800 channel analyzer. The resolution is about 0.5%. The accuracy of measurement of the abundance ratio can reach ±1.5% [3].

2. Procedure of Analysis

According to the characteristics of measuring residual plutonium described above, we have drawn up the following radiochemical analysis procedure.

A. Decomposition of the sample: Take a flat bottom flask containing an appropriate amount of concentrated sulfuric acid, preheat it until the sulfuric acid starts to smoke (for a fixed amount of sample, we must first accurately add the plutonium diluent), place the content in a piece of ethylene superchloride cloth which has collected a sample of cloud debris. After reflux carbonization until the color becomes brown, add hydrogen superoxide for oxidation until the liquid becomes clear, then transfer contents to a platinum evaporation vessel and use concentrated nitric acid to wash the flask several times, add hydrofluoric acid to drive away silicon. Finally, use 10 milliliters of 1N HNO_3 solution to soak and extract the residues.

We used simulated samples (^{239}Np, ^{239}Pu and ^{235}U indicators and 1000 cm^2 filter cloth) to examine the degree of asynchronism of chemical loss of plutonium, uranium, and neptunium in the decomposition process of the sample by the acid method. The samples were treated by the acid solution method and the ^{239}Np in the 10 milliliters of 1N HNO_3 sample solution obtained was measured using the NaI(Tl) multichannel γ spectrometer, then we separately added fixed amounts of natural uranium diluent and plutonium-240 diluent (^{240}Pu/^{239}Pu (atomic ratio) = 31.76%, concentration error of ±3%). Finally we used mass spectrometric analysis of the isotopic dilution to measure the ^{239}Pu and ^{235}U [4,1] in the sample solution. The results are listed in Table 1.

Table 1. Examination of Asynchronism of Chemical Loss of Plutonium, Uranium and Neptunium in the Process of Sample Decomposition

Sample	1	2	3	4	5	Average number values
U/Pu	0.903	0.933	0.989	0.998	1.002	0.965(1±0.040)
Np/Pu	0.931	0.922	0.943	0.943	0.972	0.942(1±0.011)

We can see from the results in Table 1 that when using the acid method to decompose the samples, the degree of asynchronism of the loss of the dissolved samples of uranium, neptunium and plutonium is less than 5%, satisfying the requirements of the test.

B. The separation and purification process of plutonium: We utilized the changes in the valence states to separate and purify plutonium. We used ferrous sulfamic acid and sodium nitrite in a 1N HNO_3 medium to regulate plutonium as Pu(IV). At this time, the neptunium was Np(V) while uranium and americium were generally U(VI) and Am(III). By using the method [5] of TTA extraction we first extracted Pu(IV) from the above described solution and realized quantitative separation of U(VI), Np(V), and Am(III). Finally, we used the anion exchange method to purify Pu(IV) [6].

Under ordinary conditions, the requirements can be satisfied by the two steps of purification above. But when the amount of ^{239}Np produced is large, and to increase cleansing of neptunium and shorten the time interval of eliminating neptunium, we studied the quantitative reduction of Pu(IV) in a medium of 8N HNO_3 to Pu(III) while neptunium was Np(IV), and neptunium was further eliminated through the anion exchange column [7].

The cleansing and the chemical retrieval rate of each separation step of the process for plutonium are listed in Tables 2-4.

Table 2. Cleansing of the Total Fragment and Uranium, Neptunium, Americium During Each Separation Step of the Process

Nuclear element Cleansing factor Separation step	U	Np	Am	Total fragments*
TTA extraction Pu(IV)	10^3	$5x10^2$	$4x10^3$	10^2
Pu(III) through a 201x5 resin column	--	10^3	--	--
201x5 resin column purification of Pu(IV)	$2x10^2$	--	$1.6x10^4$	$2x10^3$

---

*Uranium of 90% concentration was radiated in the reactor and cooled for 4 days.

Table 3. Reduction of Pu(IV) in 8N HNO_3 Solution

$Fe(NH_2SO_3)_2$, M	$N_2H_4 \cdot H_2O$, M	Pu(III) in the liquid flowed out, %	Pu(IV) remaining in the column, %	Remarks
0.016	--	38.0	--	Air bubbles appeared in the column
0.025	--	68.2	--	
0.012	0.024	57.0	--	Air bubbles appeared in the column
0.016	0.016	74.2	15.9	
0.020	0.020	83.0	10.1	
0.025	0.025	85.1	9.1	
0.032	0.032	82.4	9.8	

It can be seen from the results listed in Table 3 that we added 0.020-0.025M $Fe(NH_2SO_3)_2$ and $N_2H_4 \cdot H_2O$ in a solution of 8N HNO_3 to reduce the elements under room temperature for several minutes, then we passed the solution at a speed of flow of 0.6 to 0.8 milliliter/minute through a 201x5 resin column of 2-3 centimeters high with an inner diameter of 0.4 centimeters, used 2-3 milliliters of 8N HNO_3 solution to wash the content, and found the collecting solution contained about 83% of plutonium. According to documentary reports [7], lowering the acidity can reduce the distribution coefficient of Pu(IV) on the anion exchange resin and increase the efficiency of washing and extraction of plutonium. Experiments prove that if we use 3 milliliters of a 5.5N HNO_3 solution for washing, the retrieval rate of plutonium can be increased to above 94% and cleansing of neptunium can reach 10^3.

Table 4. Retrieval Rates of Plutonium During Each Purification Step

Sample number Retrieval rate, % Separation steps	1	2	3	4	5	Average values
201x5 resin column purification of Pu(IV)	94.8	96.5	—	—	—	95.7
TTA extraction + anion exchange	91.5	96.0	91.6	92.6	—	92.9(1±2.3%)
Ion exchange twice	94.7	90.6	93.1	91.4	91.1	92.2(1±1.8%)

According to the experimental results described above, the steps of separation and purification of plutonium should be:

1) Add ferrous sulfamic acid solution to 1N HNO_3 sample solution (so that the (Fe^{2+}) = 0.02-0.025M), reduce plutonium to Pu(III), then use an appropriate amount of sodium nitrite in a water bath of about 90°C to oxidize Pu(III) to Pu(IV). Use 0.5M TTA-xylene to extract Pu(IV) for 15 minutes ($V_{organic}/V_{water}$ = 1/2). After extraction stops, record the separation time of plutonium.

2) Use 1N HNO_3 solution to wash the organic phase for 2 to 3 minutes.

3) Use 8N HNO_3 solution for reverse extraction of Pu(IV) in the organic phase for 10 minutes ($V_{organic}/V_{water}$ = 1/1).

4) Use xylene for washing and reverse extraction for 2 to 3 minutes.

5) In the above 8N HNO_3 liquid of reverse extraction, simultaneously add ferrous sulfamic acid and water and hydrazine reducing agent (so that the concentration is 0.02-0.025M), after a few minutes, use a 0.6-0.8 milliliter/minute flow to pass the solution through the anion exchange column (the column is 2 to 3 centimeters tall, the inner diameter of the column is 0.4 centimeters, 201x5 resin with 100 to 160 pores), and use a small amount of 5.5N HNO_3 solution for washing, then combine the secreted liquid and the washing liquid.

6) Use sodium nitrite to oxidize the above plutonium solution in a water bath of about 90°C, use a flow speed of 0.25 milliliter/minute to pass the liquid through an anion exchange column (column height is 5 to 6 centimeters, the inner diameter of the column is 0.2 to 0.3 centimeters, 201x5 resin with 100 to 160 pores or Dowex 1x2 resin with 100 to 200 pores), and separately use 8N and 5.5N of HNO_3 solution for washing. Finally, use 6 milliliters of 1N HCL or 10 milliliters of 0.3N HNO_3 to desorb Pu(IV) under room temperature.

7) Evaporate the desorption liquid, use a small amount of concentrated nitric acid to destroy the traces of organic matter. Use several drops of 1N HNO_3 solution to soak and extract plutonium, and transfer the contents into a glass flask for small samples, bake the contents under an infrared lamp until several microliters remain for mass spectrometric analysis. Or, subject the content to electric sedimentation for 1 hour [2] under a current density of $200 mA/cm^2$ at 8 to 10 volts in an ammonium oxalate-sodium nitrate system of pH 2 to pH 3 for α spectrometric analysis.

C. Method of storing and standardization of the plutonium diluent: According to the characteristics of our work, we used a 4N HNO_3 solution to produce the plutonium diluent and stored it in a polyethylene bottle and in a dryer with a bottom having the same acidity as the diluent solution. When using the solution, a 10-milliliter polyethylene measuring flask with a pointed beak is used to siphon out a portion of the content from the storing flask, and after use the container should be returned to the dryer. According to documentary reports [8], using polyethylene bottles to store radioactive solutions can reduce the introduction of nonradioactive impurities, therefore it is beneficial for the preparation of the source for α measurements.

Table 5. Permeation and Volatility of the Plutonium Diluent Solution in the Polyethylene Weighing Bottle*

Days of storage	1	2	5	15	40
Amount of variation of the solution, milligram	+0.08	+0.26	+0.38	+1.60	+2.20
Times of experiment	3	10	7	6	3

*The total weight of the weighing flask and the solution is 5 to 8 grams.

It can be seen that during the short period of storage, the loss due to permeation and evaporation of the sample in the bottle is negligible.

When standardizing, a fixed amount of plutonium diluent solution must be accurately weighed and directly dripped into the center of a piece of stainless steel of a diameter of 25 millimeters and allowed to dry out of the sun under room temperature, and then absolute measurements are taken in the α ionization chamber.

We used the standard solution of plutonium-239 (error of 0.9%) produced by the French BNM Company and examined the accuracy of the above method of producing the source material and the measurements of the ionization chamber. The results of the examination are given in Table 6. Compared to the standard value (1589.5 dpm/mg solution) it is slightly lower by 0.9%, but within the error range.

We observed the change in concentration of two types of plutonium diluents during the course of storage. The results are shown in Table 7.

Table 6. Comparative Results With the French Plutonium-239 Standard Solution

Number	Weight of source liquid, mg	Measured value, dpm	Concentration, dpm/mg solution	$\Delta\sigma$, %
1	14.003	21978.4	1567.0	-0.5
2	28.267	44584.9	1576.9	0.1
3	29.715	46905.0	1578.1	0.2
4	85.595	135065.9	1577.6	0.2
Average			1575.0	±0.33

Table 7. Results of Determining the Concentration of Two Types of Plutonium Solutions During the Course of Storage

Types of solutions

^{239}Pu*	Month and year of standardization	1976,7	1977,3	1978,8
	$^{239+240}$Pu, dpm/mg solution	20.77	20.77	20.71
	Standard deviation, %	±0.6	±0.4	±0.4

^{238}Pu	Month and year of standardization	1976,6	1977,3	1977,8	1978,1	1978,10	1979,4
	^{238}Pu, dpm/mg solution	46.66	47.00	46.44	46.79	46.67	46.73
	Standard deviation, %	<±1.0	<±1.0	<±1.0	<±1.0	<±1.0	<±1.0

---

*^{240}Pu/^{239}Pu (atomic ratio) = 2.795%.

3. Methods of Measurement

A. Mass spectrometric analysis: The mass spectrometer is used to measure the abundance ratio of ^{239}Pu and ^{241}Pu in the sample. Or, the abundance ratios of ^{242}Pu and ^{239}Pu in the sample can be measured first without adding the plutonium diluent and then after adding the plutonium diluent, and the amount of ^{239}Pu in the sample is calculated according to the following formula of the method of mass spectrometric dilution:

$$^{239}\mathrm{Pu}_s = {}^{242}\mathrm{Pu}_d \times \frac{R_d - R_M}{R_M - R_s} \times \frac{242}{R_d \times 239} \cdot \qquad (6)$$

In the formula, ^{239}Pu$_s$ represents the weight of ^{239}Pu in the sample to be measured; ^{242}Pu$_d$ represents the weight of ^{242}Pu after adding the diluent; R_d represents the atomic ratio of ^{242}Pu and ^{239}Pu in the ^{242}Pu diluent; R_M represents the atomic ratio between ^{242}Pu and ^{239}Pu in the sample to be measured after adding the ^{242}Pu diluent; R_s represents the atomic ratio between ^{242}Pu and ^{239}Pu in the sample.

B. α spectrometric analysis: The semiconductor α spectrometer is used to measure the ratios of α radiation of ^{238}Pu and ^{239}Pu and ^{240}Pu in the sample to be measured. Or, the ratio of α radiation of ^{238}Pu, ^{239}Pu and ^{240}Pu in the sample to be measured can be measured after adding the ^{238}Pu or ^{239}Pu diluent, and the amount [3] of ^{239}Pu in the sample can be calculated according to the following formula of the α dilution method:

1) When the ratio of α radioactivity of ^{238}Pu, ^{239}Pu and ^{240}Pu in the sample is small (usually less than 10%), the amount is

$$^{239+240}Pu_s = \frac{^{238}Pu_d}{a_2 - a_1}. \tag{7}$$

2) When the ratio of α radioactivity of ^{238}Pu, ^{239}Pu and ^{240}Pu in the sample is large (usually larger than 100%), it is

$$^{239+240}Pu_s = \frac{a_2 - a_3}{a_1 - a_2} \times {}^{239+240}Pu_d. \tag{8}$$

In the formulas, α_1 represents the ratio of α radioactivity of ^{238}Pu, ^{239}Pu and ^{240}Pu in the sample; α_2 represents the ratio of α radioactivity of ^{238}Pu, ^{239}Pu and ^{240}Pu in the sample to be measured after adding the ^{238}Pu or $^{239+240}Pu$ diluent; α_3 represents the ratio of α radioactivity of ^{238}Pu, ^{239}Pu and ^{240}Pu in the $^{239+240}Pu$ diluent; $^{238}Pu_d$, $^{239+240}Pu_d$ respectively represent the amount of ^{238}Pu, ^{239}Pu and ^{240}Pu diluents (dpm); $^{239+240}Pu_s$ represents the amounts (dpm) of ^{239}Pu and ^{240}Pu in the sample to be measured.

III. Discussion

1. Error Analysis

A. Direct subtraction method: Besides the separation and condensation of plutonium and uranium in the nuclear cloud and the effects of asynchronous loss of plutonium, uranium and neptunium in chemical operations, we know from equation (2) that the error in measurement of $^{239}Pu_R$ is mainly determined by the errors of measurement of each quantity in the equation.

Let $^{239}U_o$ be the sampling coefficient (ε), then equation (1) can be written as

$$^{239}Pu_R = {}^{239}U_o\left[\frac{(^{239}Pu_t)_s}{^{239}U_s} - (1 - 1.007e^{-\lambda_1^{*}t})\right]. \tag{9}$$

Generally speaking, the analyzed error of $^{239}U_o$ in the cloud is less than 3.5%; the errors of measurements of the amount of $^{239}U_s$ in the sample and the amount of ^{239}Pu at time t may respectively reach 3.0% and 2.0%. We know from equation (9) that $\Delta^{239}Pu_R/^{239}Pu_R$ is not larger than $\pm 5.0\%$, and it rapidly increases as the amount of $^{239}U_o$ increases. Therefore, this method is more suitable when $^{239}U_o/^{239}Pu_R$ is small, and quantitative separation of uranium and plutonium should occur as early as possible.

B. Linear fitting method: From equation (5) we know that the error is mainly determined by the accuracy of measuring the b/a value and the error in the analysis of the amount of $^{239}U_o$. Generally speaking, $\Delta^{239}Pu_R/^{239}Pu_R \leq \pm 4.0\%$. If the amount of $^{239}U_o$ is large, the error of the value b will slightly increase, but the error of the value a will be smaller. Conversely, if the amount of $^{239}U_o$ is very small, the error of the value of a may be very large, and even to a point where we cannot find $^{239}Pu_R$ directly from b/a. Therefore, when $^{239}U_o/^{239}Pu_R$ is larger, this method is obviously superior.

2. Errors That May Possibly Be Brought About by Obtaining the Sampling Coefficient Via Uranium

Separation and condensation in nuclear explosions are common problems. The physical and chemical properties of uranium and plutonium are different. Under certain specific conditions of explosion, the two undergo separation and condensation, and under most situations they are not obvious, thus their separation and condensation do not affect the accuracy of measuring residual plutonium.

This article was written by Chen Zhongdui [7115 1813 1417] and Liu Guoxing [0491 0948 5281].

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9296
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BRIEFS

ELECTRON BEAM EXPOSURE SYSTEM--Beijing, 30 Dec (XINHUA)--China has developed a high-precision electron beam exposure system that uses computers and a double laser beam stage for the nation's electronics industry, said a spokesman for the Fourth Ministry of Machine Building today. The system, developed by the Changsha Semi-Conductor Equipment Institute under the ministry over 7 years, can be used for making large-scale and very-large-scale integrated circuits, microwave, magnetic bubble and surface acoustic wave devices. Development of the system is a breakthrough in China's electronics industry, meeting the needs of fabricating microstructure equipment, said specialists and technicians from 50 organizations after an appraisal of the system in mid-December. Seven electronics research institutes in Beijing, Nanjing, Hebei, Sichuan and Shanghai have tested the system and reported successful operation. [Text] [Beijing XINHUA in English 0716 GMT 30 Dec 81 OW]

SCIENTIFIC-TECHNOLOGICAL MEETING--Beijing, 25 Dec (XINHUA)--The China Association for Science and Technology held a meeting in Beijing 18-24 December to exchange experience in providing scientific and technological advice. Over 120 representatives from various localities across the nation carried out discussions on the purpose and organization of and the tasks and funds in scientific and technological information. [Beijing XINHUA Domestic Service in Chinese 1422 GMT 25 Dec 81 OW]

CSO: 4020/66

SHAANXI SCIENTIFIC ASSOCIATION HOLDS CONFERENCE

Xian SHAANXI RIBAO in Chinese 11 Nov 81 p 1

[Article by staff reporter: "Second Conference of the Provincial Scientific Association Closes Victoriously; Comrade Zhang Ze Makes Important Closing Speech, Emphatically Pointing Out: We Must Fully Develop the Function of the Scientific Association in Building the Four Modernizations, Conscientiously Implement the Guideline of Using Scientific and Technical Work To Serve Economic Construction, Encourage the Spirit, and Drum Up Our Energy To Make More Contributions to the Development of Our Province's Science and Technology"]

[Text] The Second Conference of the Shaanxi Provincial Science and Technology Association was held over a 5-day period. It completed its scheduled tasks satisfactorily, and the meeting closed victoriously on 10 November.

The closing ceremony was presided over by the executive chairman of the conference, Zhao Wenqin [6392 2429 2953]. At 9 am, over 500 delegates walked happily into the conference hall and participated in the closing ceremonies. The permanent secretary of the provincial party committee, Zhang Ze [4545 3419], attended the conference and made an important speech.

Comrade Zhang Ze emphasized three aspects in his speech. First, we must fully develop the function of the scientific association in the building of the four modernizations. In marching toward scientific and technological modernization, the party committees at each level must emphasize the development of the functions of scientific and technological mass organizations. In economic work, emphasis must be placed on elevating the standards of science and technology in production and also on scientific management in order to elevate the standards of business management. In scientific research, these two aspects must be emphasized. Science and technology are developing in a highly diversified and highly comprehensive direction; the main trend is toward comprehension. These new characteristics of scientific and technological development require a strengthening of the link between the sciences and specializations, and multidisciplinary and comprehensive discussions and research must be carried out on some special topics. The scientific association, as a joint organization of mass scientific and technical organizations, possesses characteristics spanning the professions and spanning the various disciplines. It is a gathering of all kinds of specialized talent. It facilitates the organizing of coordinated multidisciplinary research, and it serves to link scientific and technical workers. In this regard, the scientific association can do a lot. Second, we must conscientiously implement the guideline of using scientific and technical work to serve economic construction. Science and technology have many fields and should serve every aspect, but the emphasis should be on serving economic construction. They should especially serve to solve the problems with major economic ramifications for the national economy. In his speech, Comrade Ma Wenrui [7456 2429 3843] proposed 10 "topics" which have strategic significance for the development of our province's economy. Researching and solving these problems well will serve importantly to change the backward situation of our province's industrial and agricultural production. At the same time, we must strengthen the popularization and application of scientific and technical achievements in a big way. This work is still a weak link in our province. We should do the work of popularization and application well so that the achievements resulting from the hard work of scientists can develop the proper economic gains. Third, we must encourage the spirit and drum up our energy to make more contributions to the development of our province's science and technology. We must promote our province's science and technology in order to serve the national economy better. Each scientific and technical worker must have a high spirit. Party committees at each level must further implement the party's policy concerning intellectuals, care about the ideological progress of intellectuals and the improvement of work, truly strengthen ideological and political work, and fully mobilize the enthusiasm of the broad numbers of scientific and technical workers. Comrade Zhang Ze said in conclusion that the party and the people hope that our rich scientific and technical achievements will make greater contributions toward the building of the four modernizations, toward the prosperity of science and technology, and toward the development of the national economy.

After Comrade Zhang Ze concluded his speech, the entire body of delegates passed the resolution of the conference. The resolution stipulated that the conference has unanimously agreed with the working report by Comrade Hou Zonglian [0186 1350 3425] presented on behalf of the provincial scientific association. The conference requested the scientific associations at each level and all members of their subordinate organizations and the broad ranks of scientific and technical workers to insist on the four basic principles, under the leadership of the party committee at each level, to encourage the spirit, to link efforts with the actual situation in Shaanxi, closely keeping the buildup of the four modernizations as the center, to broadly carry out academic exchange, to do the work of popularization of science well and in a big way, actively to carry out consultation services, and to contribute one's own wisdom and talent to the glorious socialist enterprise.

The executive chairman of the conference, Tao Xinyong [7118 0207 6978], delivered the closing remarks. He said that the delegates attending the conference are full of high spirit, that they are enthusiastic, and that they have all expressed the will to follow the model of the older generation of proletarian revolutionaries in order to combine theoretical research and production practices and to struggle hard to climb the peak of science and technology.

Secretary Nie Chunrong [5119 2504 2837] of the Secretariat of the China Scientific and Technical Association attended the conference and spoke to the conference on 8 November.

During the conference, comrade delegates summarized the work of the scientific association and the society according to the guidelines concerning the development of science and technology issued by the Chinese Communist Party Central Committee and the State Council and the spirit of the speech by Comrade Hu Yaobang at the "Second Congress" of the China Scientific and Technical Association. They also studied and determined future tasks. All delegates, after thorough deliberation, democratically elected 192 comrades to form the second committee of the provincial scientific association. During the conference, the delegates also put forth over 90 proposals and suggestions which will be studied and dealt with by the second committee of the provincial scientific association.

On the afternoon of 10 [November], the responsible comrades of the provincial party committee, the standing committee of the provincial people's congress, the provincial government, and the provincial political consultative conference--Ma Wenrui, Yu Mingtao [0060 2494 3447], Zhang Ze [4545 3419], Jiang Yi [1203 0001], Chen Yuanfang [7115 2429 2455], Xie Huaide [6200 2037 1795], He Chenghua [0149 2110 5478], Zhang Yizhen [1728 3015 1820], Sun Zuobin [1327 0155 6333], Lin Yinru [2651 5419 1172], Hou Zonglian, Zhang Hanwu [1728 3352 2976], Dong Xueyuan [5516 1331 3293], Wang Jie [3769 2638], Deng Guozhong [6772 0948 1813], Tan Weixu [6151 4850 3563], Fan Ming [5400 2494], Fu Daoshen [0265 6670 0135], and Wu Shengxiu [0702 3932 4423]--received all the delegates and comrades attending the conference, and a group picture was taken.

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GUANGDONG-HONG KONG TELECOMMUNICATIONS LINKS

HK300126 Hong Kong SOUTH CHINA MORNING POST in English 30 Dec 81 Business News p 1

[Text] Telecommunications links between Hong Kong and Guangzhou will be vastly improved by the end of next year when a HK$14 million, 2,700-channel microwave communications system is installed.

At present, telephone communications are effected by a 300-channel coaxial land cable which is now inadequate because of the rapid expansion of links between the two cities.

The new microwave communications system will also greatly improve the quality of the service.

Equipment is to be supplied by a Japanese firm, Sumitomo Corp, and a contract was signed in Hong Kong yesterday between the managing director of Cable and Wireless (HK), Mr Brian Pemberton, and the managing director and general manager of Sumitomo Corp (HK) Ltd.

Mr Pemberton signed both on behalf of his firm and the Guangdong Posts and Telecommunications Administrative Bureau [GPTAB].

The project, to cater for the rapid expansion of telecommunications links between the two territories, was first announced in March this year when GPTAB and Cable and Wireless signed an agreement in Guangzhou for the joint venture to install the system.

The divisional manager, local engineering, at Cable and Wireless (HK), who heads the project team in the colony said that the contract is for the supply of equipment to be manufactured by Nippon Electric Co Ltd (NEC), including antennae, microwave terminal and multiplex equipment, and a related cable system.

Delivery is due to be completed by next September, and installation will be carried out by Cable and Wireless and GPTAB staff.

Mr Fung also disclosed that the system will initially be equipped for 800 channels, and will link Hong Kong, Shenzhen, Zhuhai, Dongguan and Guangzhou.

The existing communications links have often given rise to complaints of disruption, as the coaxial cable was severed during construction work in the new territories.

On one occasion, too, severe flooding north of Shenzhen also disrupted the link.

CSO: 4020/66

AUTHOR: WEI Meide [7614 5019 1795]
LIU Zhenghui [2692 2973 6540]

ORG: Both of Photosensitive Chemistry Institute, Chinese Academy of Sciences

TITLE: "The Influence of β-carotene and R-phycoerythin on the Photoelectric Effects of Chlorophyll-containing Bilayer Lipid Membranes (BLM)"

SOURCE: Beijing SHENGWUXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 5, Oct 81 pp 32-35

ABSTRACT: This paper reports an experiment using extracts of spinach to prepare the artificial BLM by adding β-carotene and simulated chloroplast membranes made of R-phycoerythin, to observe and study some photoelectric effects for the purpose of finding the energy transfer relationship and result among several photosynthesis pigment proteins. Results indicate that in the system of ascorbic acid/Chl-BLM/Fe^{+3} with electron donor and receptor added and under the condition of light exposure, obvious photoelectric effects may be obtained but the results are lower than those reported in BIOCHEM BIOPHYS Acta No 597, 1980 p 433 and in TOPICS IN PHOTOSYNTHESIS 1979 p 115. This is perhaps due to the low centrifugal speed for extracting spinach chlorophyll and other factors of this experiment. Details of the experiment are reported.
This paper was received for publication on 2 Dec 80.

AUTHOR: YAO Guozheng [1202 0948 2973]

ORG: The 5th Laboratory, Institute of Biophysics, Chinese Academy of Sciences

TITLE: "The Effect of Selective Spatial Filtering on Depth Perception"

SOURCE: Beijing SHENGWUXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 5, Oct 81 pp 39-42

ABSTRACT: It has been proven that the major source of information for depth perception is the parallax of the 2 eyes while a spatial harmonic wave decomposition exists in the human visual system and the visual parallax and the spatial frequency spectrum are related. It appears that parallax information is distributed in every frequency band. Can depth perception be produced by a random combination of frequencies? Do higher energy frequencies contribute more to visual parallax and hence more favorable for depth percention? This paper reports an experiment using spatial filtering method to analyze the ability of those high energy spatial frequency elements to produce depth perception? The influence of psychological factors on depth perception is also investigated. It appears that beyond parallax of the 2 eyes, the totality of the object is also involved. If through selective spatial filtering, a "noise" is introduced to alter the original shape, depth perception may be completely lost.
This paper was received for publication on 31 Oct 80.

6248
CSO: 4009/170

AUTHOR: ZHU Jinbiao [2612 6855 2871]

ORG: None

TITLE: "High Intensity Electromagnetic Interference Resistance Test of Optical-fiber Cable Communication"

SOURCE: Beijing DIANZI KEXUE JISHU [ELECTRONIC SCIENCE AND TECHNOLOGY] in Chinese No 12, Dec 81 pp 37, 6

ABSTRACT: This test is performed on the experimental section of a circular electrified railway, using a digital communication system of a transmission speed of 8.44 Mb/s and a simulated video telephone system. The digital system has an optical-fiber cable of 6.19 km in length, installed on poles parallel to a high voltage (25kV) line. The PCM-120 audio digital terminal and the 1MHz video PCM terminal are monitored by a signal distortion testing instrument. There is also an indoor disk of optical fiber of 4.16 km in length. A total of 12 fixed and 2 portable receivers are connected. The traction current of the electric cars is 260A to 500A. Under a simulated full load condition and a speed of 45 to 87 km/hr, the cars are driven 6 full circles for the test. Aside from some wrong signals occurring when the coupler of the detector comes loose a few times, signal distortions caused by electromagnetic interference of the running cars do not appear. The error rate stays below 10^{-9}. The test results demonstrate that as far as electrified railway is concerned, optical fiber is the best form of communication and that in China, optical fiber, optical-fiber cable, optical devices, and optical communication system are ready for the adoption of the railway departments.

6248
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ORG: Special Correspondent of the Journal

TITLE: "Announcement of the Third National Quality Competition of Black and White Television Sets"

SOURCE: Beijing WUXIANLIAN [RADIO] in Chinese No 11, 11 Nov 81 p 15

ABSTRACT: The Third National Quality Competition of Black and White T.V. Sets organized by the National Bureau of Broadcasting and Television Industry was held on 18-24 Sep this year. Compared with the last competition (in 1979) several new items, such as useful life under high temperature, 1500 V resistance, fire safety, interference resistant property, etc. were added and the standard in all items of competition was raised. The competition was restricted to 31cm (12-inch) sets, and BW sets of the same size manufactured in Japan were chosen to compare with participating sets. The competition was divided into the 3 categories of sets of all Chinese-made components, sets made with imported kinescope, and sets made with imported kinescope and imported integrated circuits. The first prize of the first category went to Feiyao-12D3G set made by Shanghai Radio Plant No 18, with Xihu-31 HD-1 of Hangzhou Television Receiver Plant, the Kunlun-B315 of Beijing Dongfeng T.V. Plant, the Xinghuo-JDS4G of Shanghai Renmin Radio Plant, etc. receiving second prizes. Winners of other categories are also listed. Of all the sets judged 86.2 percent were rated to be comparable or surpassing in quality when they were tested against foreign sets. But, compared with the advanced levels of foreign makes, the Chinese sets were still behind in some aspects [not specified in the paper] and further struggle was still needed.

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Nuclear Techniques

AUTHOR: LIANG Yusheng [2733 3254 3932]
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TITLE: "Quantitative Analysis of Distant Region Atmospheric Deposit of Debris from Nuclear Explosion Using Ge(Li) γ-ray Spectra"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 6, Dec 81 pp 11-16

TEXT OF ENGLISH ABSTRACT: We describe a method and show the measurement results of the radioactive fallout samples collected from the Shanghai area soon after the March 1978 Chinese nuclear test. These environmental samples, which contain about 20 short-lived γ-emitting isotopes, have very weak radioactivity (10^{-11} ~ 10^{-9} curies). Two algorithms are used to determine the peak areas: the Wasson Algorithm (WA) for single peaks, and the nonlinear least-squares fitting algorithm without matrix inversion (AWMI) for unresolved peaks. It has been proved successful to apply this combined method to low-level γ-ray spectrum assay.

Results of γ-ray spectrum analysis of fallout samples from a large area of Shanghai following the 15 March 1978 nuclear explosion (composite from five surveys; date converts to 20 March 1978):

[Continuation of HE JISHU No 6, Dec 81 pp 11-16]

Nuclide (half-life)	Quality (photoelectric peak number)	Quantity (Unit: 10^{-10} Ci)
^{97}Zr(17h)—^{97m}Nb(54s)	3	3
^{133}I(21h)—^{133}Xe(5d)	6	49.5
^{143}Ce(33h)	1	14.6
^{105}Rh(1.5d)	2	
^{239}Np(2.35d)	over 6	
^{122}Sb(2.7d)	2	11
^{99}Mo(2.75d)—^{99m}Tc(6h)	4	52.8
^{132}Te(3.25d)—^{132}I(2.3h)	23	263
^{127}Sb(3.85d)—^{127}Te(9h)	4	
^{131}I(8d)	4	96.3
^{147}Nd(11d)	2	~8
^{140}Ba(12.8d)—^{140}La(40h)	12	^{140}Ba:41; ^{140}La:66
^{141}Ce(32.5d)	1	22.4
^{103}Ru(39.4d)	2	40
^{7}Be(53d)	1	7
^{95}Zr(65.5d)—^{95}Nb(35d)	3	^{95}Zr:10; ^{95}Nb:3
^{124}Sb(60d)	2	1
^{144}Ce(284d)	1	2.5
^{106}Ru(368d)—^{106}Rh(30s)	2	2.6

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ORG: All of the Institute of Geology, National Bureau of Seismology

TITLE: "Characteristics of Fault Rocks and Their Potential Evidences for Seismic Events"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 4, 1981 pp 1-14

TEXT OF ENGLISH ABSTRACT: It has been found from field observation and laboratory study that the fault rocks on the Beishicheng fault zone in the Miyun region, Beijing, can be classified into four main types: cataclasite series, mylonite series, pseudotachylite and fault gouge. They have distinct features in mineralogy, deformation and microfabric, representing the different mechanisms of their origin. It is shown by the features and occurrences of the fault rocks in this region that the fault zone had experienced two stages of movement of different mechanical behaviors: the ductile shearing in the early stage and the brittle fracturing in the late stage accompanied by seismic events.

The existences of pseudotachylite and cataclasite types of fault rocks can be regarded as the potential evidences for seismic events. The former is produced by

[Continuation of DIZHEN DIZHI No 4, 1981 pp 1-14]

preferred melting of minerals in country rocks due to the frictional heating on the fault plane during seismic faulting, while the latter is a product of brittle fracturing due to rapid release of strain energy. During rapid frictional heating process of seismic faulting the mafic minerals are the first to be melted, but the felsic minerals are melted at a temperature much higher than the mafic ones so that the SiO_2 contents in the pseudotachylite are much lower than those in the country rocks. This is why the cruch breccia and breccia in pseudotachylite consist mainly of felsic materials, and these characteristics are completely different from those of magmatic origins.

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ORG: Wu of the State University of New York; ZHANG Yuming, FANG and ZHANG Shiliang all of the Institute of Geology, National Bureau of Seismology

TITLE: "On the Activity of the Tancheng-Lujiang Fault Zone in China"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 4, 1981 pp 15-26

TEXT OF ENGLISH ABSTRACT: This work is based on data of the interpretation of false color densite slicer, the fracture profiles, tectonite, fault gouge obtained from the investigations along the middle and southern segments of the Tancheng-Lujiang fault zone as well as the studies of Quaternary active faults. Part of the data cited here came from previous works on regional geology and geophysics. Some topics, such as the extension, deep geological features, tectonic movement, evolution history and current activity of these segments of the fault zone concerned in which interest is growing, are dealt with in this paper.

From our research results we come to a preliminary idea that the Tancheng-Lujiang fault zone in east China is a complex fault zone which has been undergoing a long

[Continuation of DIZHEN DIZHI No 4, 1981 pp 15-26]

tectonic activity, following intense reformation, and is one of the main fault zones controlling the occurrence of strong earthquakes in east China. The constitution and deformation characteristics of both bottom and cover of this fault zone are sharply different from each other on its opposing sides. The oldest trace showing the activity of this fault zone can be found in the Archaean Taishan Group, occurring in the host within this zone.

The schitosity of the Taishan complex along this zone shows an obvious local left-lateral drag which is also found in the Dabie Group (metamorphic series of rocks) along the SE foothills of Mount Dabieshan. This explains the significant horizontal displacement along this fault zone during the Pre-Sinian period.

From the Sinian period up the the Late Triassic period, in the Changjiang block fault running on the eastern side of this fault zone marine sediments were deposited while the north Jiangsu-east Shandong region uplifted for a long time. From Late Proterozoic to Early Cenozoic the north China type of marine sediments were developed in the vast area west of this fault zone, which were followed by the continental sedimentation.

In the Mesozoic time the activity of this fault zone only occurred from the Indo-Chinese to the Yanshanian ages, with the dominance of the latter. Judging by the metamorphic series of rocks found on the northern foothills of Dabieshan and Jiaonan County, we can estimate that the total amount of displacement here is 520 km.

[Continuation of DIZHEN DIZHI No 4, 1981 pp 15-26]

In fact it can be regarded as a resultant amount of displacements from lots of tectonic movements in geological history, partly belonging to the Proterozoic and partly to the Hercynian and Indo-Chinese left-lateral strike-slip.

The Himalayan movement probably caused the change in the nature of the Tancheng-Lujiang fault zone activities from left-lateral displacement to right-lateral with thrusting movement. There is evidence that this fault zone was active in the Cenozoic and shows a clear lineament on the satellite images with contrast shade. The other evidence is as follows: the development of fault gouge with new stria and schistose texture and clastic materials. In addition, the geomorphological features and gravity anomaly also show its tectonic activity during the Cenozoic period.

The Cenozoic right-lateral strike-slip along this fault can be followed obviously, particularly on the Malingshan western slope, Tancheng County. In addition, the right-lateral reversed phenomenon along this fault can be observed in the place where the small coombes run through the fault, with the offset reaching 25 m. As a result, the diabase vein formed in the Late Tertiary was offset and dragged by this fault. The solution of the earthquake mechanism also reveals the fact that the fault is still subjected to the right-lateral strike slip.

[Continuation of DIZHEN DIZHI No 4, 1981 pp 15-26]

The left-lateral, right-lateral as well as tensile and compressive displacements along the fault imply that throughout the long history of the Tanlu fault the fault has had larger displacement. This may explain why the fault is such a prominent feature. This change of displacement as a function of time along major faults may be characteristic of intraplate deformation.

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ORG: Both of the Seismogeological Expedition, Shandong Seismological Bureau

TITLE: "The Statistical Results about the Relationship between the Gravitational High and Earthquakes in the North China Plain"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 4, 1981 pp 49-57

TEXT OF ENGLISH ABSTRACT: In order to determine the earthquake risk region, the relationship between the gravitational high and earthquakes occurring nearby is statistically studied by using the gravity data of the North China Plain area. The statistical results obtained indicate that the gravitational high must satisfy certain conditions in case of the occurrence of an earthquake of magnitude $M_s \geq 4$ near the anomaly area. It is found that the greatest magnitude and total seismic energy released are highly correlated to the product of the gravitational high area with the square root of its intensity. Most earthquakes of magnitude $M_s \geq 5$ took place near the position with greater form-vectors of gravitational high.

According to the statistical results we can evaluate earthquake risk regions in the North China Plain area and indicate the conditions for applying these results. Furthermore, the physical implications of statistical parameters of gravitational high are also discussed.

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